The phases of three dimensional QED

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The nature of the ground state of Quantum Electrodynamics in 2+1 dimensions and its dependence on the number of fermion flavors has been an open question for non-perturbative field theorists for over 20 years. We present preliminary results for the equation of state of QED$_3$ in an effort to understand the properties of the chiral phase transition at $N_{fc}$ (such that for $N_f < N_{fc}$ the theory’s chiral symmetry is spontaneously broken). Furthermore, we present results from simulations in the chiral limit and with an additional four-fermion interaction in the theory’s action. Our preliminary results indicate that $N_{fc} < 1.5$. 